Claims

It is claimed:

1. An in vitro method for producing neurons from astrocytes, the method comprising a culturing step of establishing a group of cells by culturing the astrocytes in vitro, and a subsequent treatment step of exposing the group of cells to at least one added factor such that neurons are produced as a result of the added factor.

2. The method of claim 1 wherein the added factor is chosen from the neurotrophin family.

3. The method of claim 1 wherein the added factor is a FGF family member.

4. The method of claim 3 wherein the FGF family member is bFGF.

5. The method of claim 4 wherein the treatment step lasts at least one day.

6. The method of claim 3 comprising a subsequent in vitro differentiation step, the in vitro differentiation step being a step of culturing the group of cells without the added factor.

7. The method of claim 6 wherein the in vitro differentiation step lasts at least one day.

8. The method of claim 6 wherein the treatment step lasts at least three days and the in vitro differentiation step lasts at least three days.

9. The method of claim 6 wherein the treatment step lasts three to nine days and the in vitro differentiation step lasts four to nine days.

10. The method of claim 1 wherein the added factor is an agent that interacts with cell receptors that are recognized by a member of the FGF family.

11. The method of claim 1 wherein the growth factor is an agent that interacts with cell receptors that are recognized by bFGF.

12. A method of producing a second cell type from astrocytes, the method comprising an initial culturing step of culturing the astrocytes and a subsequent treatment step of contacting the astrocytes with an added factor, the added factor being growth factor(s).

13. The method of claim 12 wherein the second cell type is neurons.

14. The method of claim 13 wherein the added factor is a member of the neurotrophin family.

15. The method of claim 14 wherein the member of the neurotrophin family is NGF.

16. The method of claim 14 wherein the member of the neurotrophin family is chosen from the group consisting of BDNF, NT-3, and NT-4/5.

17. The method of claim 12 wherein the second cell type is oligodendrocytes.

18. The method of claim 12 wherein the second cell type is a cell type in a less differentiated state than the astrocytes.

19. The method of claim 12 wherein the second cell type is a multipotent cell type.

20. The method of claim 12 wherein the added factor(s) are members of the neurotrophin family.

21. The method of claim 12 wherein the added factors(s) are members of the FGF family.

22. The method of claim 19 wherein the added factor(s) are members of the FGF family.

23. The method of claim 22 wherein the added growth factor includes FGF-1.

24. The method of claim 22 wherein the added growth factor includes FGF-2.

25. The method of claim 22 wherein the added growth factor includes FGF-3.

26. The method of claim 22 wherein the added growth factor includes FGF-4.

27. The method of claim 22 wherein the added factor includes at least one growth factor chosen from the group consisting of FGF-5, FGF-6, and FGF-7.

28. The method of claim 22 wherein the added factor includes FGF-8.

29. The method of claim 22 wherein the added factor includes at least one growth factor chosen from the group consisting of FGF-9 and FGF-10.

30. The method of claim 22 wherein the added factor includes at least one growth factor chosen from the group consisting of FGF-11, FGF-12, FGF-13, FGF-14, FGF-15, and FGF-16.

31. The method of claim 22 wherein the added factor includes at least one growth factor is chosen from the group consisting of FGF-17 and FGF-18.

32. The method of claim 12 wherein the added factor is an agent that interacts with cell receptors recognized by a member of the FGF family.

33. The method of claim 12 wherein the growth factor is an agent that interacts with cell receptors recognized by bFGF.

34. The method of claim 13 wherein the added factor is a neuropetic cytokine.

35. The method of claim 34 wherein the neuropetic cytokine is CNTF.

36. A method of treating astrocytes to produce a population of multipotent cells, the method comprising a step of culturing the astrocytes and contacting the astrocytes in vitro with a growth factor.

37. The method of claim 36 wherein the growth factor is bFGF.

38. A method of treating astrocytes to produce a population of cells that includes neurons and/or oligodendrocytes, the method comprising a step of culturing the astrocytes and contacting the astrocytes in vitro with bFGF.

39. A method of manipulating an in vitro culture of glial cells to produce a second cell type, the method comprising:

a culturing step of culturing a group of glial cells;

a dissociation step of dissociating the group of cells prior to the treatment step;

a subsequent treatment step of contacting the group of cells with an added factor, the added factor including at least one growth factor.

40. The method of claim 39 wherein the glial cells in the culturing step are astrocytes.

41. The method of claim 40 wherein the dissociation step includes exposing the group of cells to trypsin.

42. The method of claim 39 wherein the second cell type is a multipotent cell type.

43. The method of claim 39 further comprising the step of pretreating the cultured cells with the added factor prior to the dissociation step.

44. The method of claim 43 wherein the added factor is a neurotrophin.

45. The method of claim 44 wherein the neurotrophin is a member of the FGF family.

46. The method of claim 45 wherein the member of the FGF family is bFGF.

47. The method of claim 46 wherein the pretreatment step lasts one to seven days, the treatment step lasts three to fourteen days.

48. The method of claim 47 further comprising an in vitro differentiation step, the in vitro differentiation step being a step of culturing the cells without the added factor.

49. A method of screening growth factors for transdifferentiation, the method comprising the steps of:

(a) growing cultured cells in vitro, including a first cell type but not a second cell type;

(b) dissociating the cultured cells;

(c) replating the cells into a plurality of test well means;

(d) adding a test growth factor to the test well means;

(e) growing the cells in the test well means in the presence of the test growth factor;

(f) subsequently growing the cells in the test well means in the absence of the test growth factor;

(g) examining the cells to determine if cells of the second type are present; and

(h) running a control experiment in other test well means.

50. The method of claim 49 wherein the first cell type is astrocytes and the second cell type is neurons and the test growth factor is added to the wells in a concentration ranging from 0.05 to 1000 ng per ml.

51. The method of claim 49 wherein the first cell type is astrocytes and the second cell type is oligodendrocytes and the test growth factor is added to the wells in a concentration ranging from 0.05 to 1000 ng per ml.

52. The method of claim 50 wherein step (e) has a duration ranging from seven to twenty-eight days; and step (f) has a duration ranging from three to twenty-one days.

53. The method of claim 52 wherein step (h) is performed with bFGF.

54. The method of claim 50 wherein step (e) has a duration ranging from fourteen to twenty-one days; and step (f) has a duration ranging from seven to fourteen days.

55. The method of claim 54 wherein step (h) is performed with bFGF.

56. The method of claim 55 wherein the bFGF of step (h) is present in a concentration of at least 50 picomolar.

57. An in vitro method for producing neurons from astrocytes, the method comprising a culturing means for culturing astrocytes in vitro, and a subsequent treatment step of exposing the group of cells to at least one growth factor means, the growth factor means causing the production of neurons from the astrocytes.

58. The method of claim 57 wherein the growth factor means is a means of accomplishing the biological effects that are accomplished by bFGF.

59. The method of claim 58 wherein the treatment step lasts at least three days and the in vitro differentiation step lasts at least three days.

60. A method adapted to delivering a therapy to a human patient, the method comprising providing a group of cells and introducing the group of cells into a therapy site in the patient, wherein the group of cells are cells that have been cultured in vitro and derived from astrocytes.

61. The method of claim 60 wherein the group of cells is multipotent cells.

62. The method of claim 61 comprising the step of choosing the therapy site from the group consisting of the central nervous system, the brain, the cranium, the spine, the peripheral nervous system, the region interior to the skull, and the ganglia.

63. The method of claim 62 further including the step of treating the astrocytes with bFGF.

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